



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|-------------|----------------------|---------------------|------------------|
| 10/634,662 | 08/04/2003 | Mei Chang | 005975/P1 | 6355 |
| 44257 | 7590 | 10/10/2006 | EXAMINER | |
| PATTERSON & SHERIDAN, LLP 3040 POST OAK BOULEVARD, SUITE 1500 HOUSTON, TX 77056 | | | STOUFFER, KELLY M | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 1762 | |
| DATE MAILED: 10/10/2006 | | | | |

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/634,662

Applicant(s)

CHANG ET AL.

Examiner

Kelly Stouffer

Art Unit

1762

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 July 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2,4,5,7-11,13,14,16-18,20-22,24,27-31,33-37 and 53-75 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2,4,5,7-11,13,14,16-18,20-22,24,27-31,33-37 and 53-75 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04 August 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☒ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date See Continuation Sheet.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

Continuation of Attachment(s) 3). Information Disclosure Statement(s) (PTO/SB/08), Paper No(s)/Mail Date :11/6/03, 9/23/04, 5/25/05, 10/27/05.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments, filed 17 July 2006, with respect to the restriction requirement of 20 June 2006 have been fully considered and are persuasive. The restriction requirement of 20 June 2006 has been withdrawn.

Oath/Declaration

2. The oath or declaration is defective. A new oath or declaration in compliance with 37 CFR 1.67(a) identifying this application by application number and filing date is required. See MPEP §§ 602.01 and 602.02.

The oath or declaration is defective because:

Non-initialed and/or non-dated alterations have been made to the oath or declaration. See 37 CFR 1.52(c).

Drawings

3. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: chamber lid 132 in paragraph 0038 of the description. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner,

Art Unit: 1762

the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

4. The disclosure is objected to because of the following informalities: Reference numbers 170, 172, and 164 in Figure 2 are not defined in the disclosure.

Appropriate correction is required.

5. The amendment filed 18 January 2006 is objected to under 35 U.S.C. 132(a) because it introduces new matter into the disclosure. 35 U.S.C. 132(a) states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: There is no provision in the original disclosure for the gas having a circular flow pattern passing through an expanding channel towards the substrate. There is also no support in the disclosure for the circular flow establishing a more efficient purge of the expanding channel due to the sweeping action of the vortex flow and a laminar flow purging the surface of the chamber lid and the substrate. The new matter appears in its entirety in the amendment of paragraph 0036.

Applicant is required to cancel the new matter in the reply to this Office Action.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Art Unit: 1762

6. Claims 14, 16-18, 20-22, 24, 54-61, and 63-75 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claims 14, 54, 58, 59, 61, 63, 68, 69, and 71 all require exposing the substrate to a carrier gas having a circular flow pattern. The disclosure does not contain information on a carrier gas having a circular flow pattern, nor does it enable one of ordinary skill in the art to create a carrier gas with a circular flow pattern. One of ordinary skill in the art would not recognize what is meant by the applicant when requiring a circular flow pattern or recognize its novelty or importance because of the lack of description.

Claims 16-18, 20-22, 24, 55-57, 60, 64-67, 70, 72-75 are rejected as being dependant on a rejected base claim.

7. Claims 14, 16-18, 20-22, 24, 54-61, and 63-75 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The disclosure does not contain information on a carrier gas having a circular flow pattern, nor does it enable one of ordinary skill in the art to create a carrier gas with a circular flow pattern. One of ordinary skill in the art would not recognize what is meant by the applicant when

Art Unit: 1762

requiring a circular flow pattern or recognize its novelty or importance because of the lack of description.

Claims 16-18, 20-22, 24, 55-57, 60, 64-67, 70, 72-75 are rejected as being dependant on a rejected base claim.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

8. Claims 1-2, 4, 7-10, 27-30 and 33-36 are rejected under 35 U.S.C. 102(e) as being anticipated by US Patent publication 2002/0173054 to Kim. Regarding claims 1, Kim discloses forming a ruthenium layer on a substrate comprising positioning a substrate in a chamber and exposing the substrate to a ruthenium material and reducing gas in an atomic layer deposition process where the ruthenium precursor has C1-C8 alkylcyclopentadienyl ligands (paragraphs 0019-0022). Thus Kim meets all the recitations of claim 1 at least as broadly recited by claim 1.

Regarding claim 2, Kim discloses an ALD process where the precursor, purge gas, reducing gas, and purge gas are pulsed sequentially. Kim meets all the recitations of claim 2 at least as broadly recited by claim 2.

Art Unit: 1762

Regarding claim 4, Kim discloses the reducing gas as hydrogen in paragraph 0036 line 1. Kim meets all the recitations of claim 4 at least as broadly recited by claim 4.

Regarding claim 7, Kim discloses the purge gas as He, Ar, or hydrogen in paragraph 0038.

Regarding claims 8-10, Kim discloses the pulse duration of each gas in the ALD cycle to last from 0.1 to 5 seconds, which includes the ranges required by claims 8-10. Kim meets all the recitations of claims 8-10 at least as broadly recited by claims 8-10.

Kim meets the recitations of claims 27, 29, 30 and 33-36 as discussed above. With regard to claim 28, Kim discloses repeating the ALD process until a desired layer thickness is achieved in paragraph 0028. Kim meets all the recitations of claims 27-30 and 33 at least as broadly recited by claims 27-30 and 33-36.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.

Art Unit: 1762

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

9. Claims 5, 13, 31, 53 and 62 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim in view of US Patent number 6527855 to DelaRosa et al. Kim includes all the provisions of claims 5 and 31 (substrate temperature paragraph 0025) except providing a pressure below 80 torr. DelaRosa et al. discloses the chamber pressure to range from 0.1 to 10 torr (column 3 lines 52-54) in order to affect the pulse length of gases in a desirable manner (column 3 lines 39-42).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Kim to include a chamber pressure below 80 torr as taught by DelaRosa et al. in order to affect the pulse length of gases in a desirable manner.

Regarding claims 13, 53, and 62, DelaRosa et al. includes a reactor for the ALD process that includes an inlet laminar flow expansion zone (column 4 lines 30-33) that can be considered an expanding channel from which to expel gases over the substrate at least as broadly recited in the claims.

10. Claims 11 and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim. Kim includes all of the requirements of claims 11 and 37 except for providing a specific layer width. The width of the layer, however, depends upon the number of cycles and is only important for the types of applications for which the layer will be used. (implied by Kim, entire document and paragraph 0028) The width of the layer is therefore modified by routine experimentation and is not inventive.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Kim to include the width of the layer from 10-100 Å by routine experimentation in order to meet a certain application absent evidence showing a criticality for the claimed range.

Double Patenting

11. Claims 1, 2, 14, 16, and 27-29 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-4, 11, 27-30 and 36-40 of copending Application No. 10/811230. Although the conflicting claims are not identical, they are not patentably distinct from each other because copending Application No. 10/811230 anticipates the claims of the current Application, due to the fact that the claims of the copending application are more narrow than those of the current and include all the limitations of the current claims.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kelly Stouffer whose telephone number is (571) 272-2668. The examiner can normally be reached on Monday - Thursday 7:00-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Kelly Stouffer
Examiner
Art Unit 1762

kms



TIMOTHY MEKS
SUPERVISORY PATENT EXAMINER